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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/742,306	12/19/2003	Chng Han Shen	APS03-003	5693

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EXAMINER

IM, JUNGHWA M

ART UNIT	PAPER NUMBER
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2811

MAIL DATE	DELIVERY MODE
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08/09/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/742,306

Applicant(s)

SHEN ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☒ Claim(s) 36-38 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 29, 2006 has been entered.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 13-21, 24-33 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez (US 6732913) in view of Hikita et al. (US 6965166), hereinafter Hikita.

Regarding claim 1, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 415] formed over the single substrate;

each of the two or more bump structures having a solder line; and

an epoxy layer [410] formed over the single substrate; the epoxy layer having a top surface.

Fig. 4E of Alvarez shows most aspect of the instant invention except “two or more various shaped bump structures.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures to reduce the misalignment problem.

Regarding claim 2, Fig. 1 of Hikida shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Regarding claim 13, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 410] formed over the single substrate;

each of the two or more various shaped bump structures having a solder line; and

an epoxy layer [410] formed over the single substrate; the epoxy layer having a top surface .

Fig. 4E of Alvarez shows most aspect of the instant invention except “two or more various shaped structures having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14] having a first height and one or more of the two or more various shaped bump structures having a second height that is less than the first height. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures having a second height that is less than the first height to reduce the misalignment problem.

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Regarding claim 25, Fig. 4E of Alvarez shows a die, comprising:

a single substrate [205];

two or more bump structures [210, 405, 410] formed over the single substrate;

each of the two or more bump structures having a solder line; and

an epoxy layer [410] formed over single the substrate; the epoxy layer having a top surface.

Fig. 4E of Alvarez shows most aspect of the instant invention except “the two or more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.” Fig. 1 of Hikida shows a semiconductor device with two or more various shaped bump structures [3, 14] having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hikita into the device of Alvarez in order to have two or more various shaped bump structures having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape to reduce the misalignment problem.

Regarding claims 3 and 14, Fig. 1 of Hikita shows that the two or more various shaped bump structures have a round shape, a rectangular shape, a square shape, a bar shape or a circular shape.

Regarding claims 4, 15 and 27, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a bar shape except “a width of from about 40 to 300 um and a length of up to about 3000 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a bar shape with a width of from about 40 to 300 um and a length of up to about 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim

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are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 5, 16 and 28, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a round shape except “a diameter of from about 40 to 300 um.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a round shape with a diameter of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 6, 17 and 29, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a rectangular shape except “a width of from about 40 to 300 um and a length of from about 300 to 3000 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 40 to 300 um and a length of from about 300 to 3000 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 7, 18 and 30, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a

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rectangular shape except “a width of from about 100 to 200 um and a length of from about 350 to 1200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a rectangular shape with a width of from about 100 to 200 um and a length of from about 350 to 1200 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 8, 19 and 31, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 40 to 300 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a square shape with a width of from about 40 to 300 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 9, 20 and 32, the combination of Alvarez/Hikita shows most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square shape except “a width of from about 100 to 200 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a

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square shape with a width of from about 100 to 200 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 10, 21 and 33, combination of Alvarez/Hikita shows most aspect of the instant invention including at least one of the two or more various shaped bump structures has a circular shape except “an outer diameter of from about 100 to 2500 um.”

However, it would have been obvious to one of ordinary skill in the art at the time of the invention made to have at least one of the two or more various shaped bump structures having a circular shape with an outer diameter of from about 100 to 2500 um to accommodate a design specification, since it would have been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only in routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 24, Fig. 1 of Hikita shows that the two or more various shaped bump structures have two sets of heights.

Regarding claim 26, Fig. 1 of Hikita shows that one or more of the two or more various shaped bump structures have a first height and one or more of the two or more various shaped bump structures have a second height that is less than the first height.

Regarding claims 36-38, Fig. 4 of Alvarez shows that the solder lines are above the top surface of the epoxy layer.



Claims 12, 23 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez in view of Hikita as applied to claims 1, 13 and 25 above, and further in view of Yanagida (US 6204558).

Regarding claims 12, 23 and 35, combination of Alvarez/Hikita fails to show that the epoxy layer is comprised of thermosetting resin. Fig. 1C of Yanagida shows that the epoxy layer is comprised of thermosetting resin (col. 6, line 29-30).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Yanagida into the device of Alvarez/Hikita in order to have epoxy layer comprised of thermosetting resin to protect the bumps.

Claims 11, 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alvarez in view of Hikita as applied to claims 1, 13 and 25 above, and further in view of Degani et al. (US 6734539), hereinafter Degani.

Regarding claim 22, the combined teachings of Alvarez and Hikita show most aspects of the instant invention including at least one of the two or more various shaped bump structures has a square and/or rectangular shape, however, fail to show that at least one of the two or more various shaped bump structures is employed as an RF shield or a Faraday cage. Fig. 11 of Degani shows a bump structure [111] is employed as an RF shield or a Faraday cage (col. 7, lines 36-49).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Degani into the device of and Hikita in order to have at least one of the two or more various shaped bump structures employed as an RF shield or a Faraday cage to reduce the noise.

***Allowable Subject Matter***

Claims 36-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: The reference of record fails to teach or suggest, either singularly or in combination at least the limitation of he solder lines are below the top surface of the epoxy layer or some of the solder lines are below the top surface of the epoxy layer and some of the solder lines are above the top surface of the epoxy layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Response to Arguments***

Applicant's arguments filed May 16, 2007 have been fully considered but they are not persuasive. The rejection stands and the examiner presents the remarks below in response to Applicant's arguments.

On page 18, Applicant argues that "... this etching away of the portions 505, 515 of cured layer of coating 410 could not be properly performed by one skilled in the art from the disclosure and teachings of Alvarez, if the 'various shaped bump structures' 14, 3 of Hikita were incorporated into the device of Alvarez as suggested by the Examiner." This argument is not

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persuasive. Note that Alvarez discloses that portions 505, 510 of cured layer of coating 410 is removed by an etchant. Since an etchant is in either liquid or gaseous state, removing the portions 505, 510 would be performed without difficulty.

On page 18, Applicant further argues that “... if the different shapes of Hikita were incorporated into Alvarez, then the process of Alvarez would not properly work to achieve the end results/structure disclosed by Alvarez. The layer of coating 410 would not adhere consistently (even thicknesses on corresponding surfaces) to bump structures having: various shapes (instant Claim 1); various shapes having at least two differing heights (instant Claim 13); or various shapes having a round shape, a rectangular shape, a square shape, a bar shape or a circular shape (instant Claim 25); either on their top surfaces or their side surfaces.” Note that coating 410 is initially a fluid layer covering the copper pillar 210 capped with a gold layer and cured. Therefore, it is not persuasive that the layer of coating 410 would cover/adhere consistently to bump structures with various shapes since coating is initially a fluid layer at the time of the covering the bumps 210. And through subsequent process of curing, the coating layer 410 would adhere consistently to bump structures with various shapes.

On page 19, Applicant argues that “...such a consistency of thickness of the layer of coating 410 is required in Alvarez to achieve its stated and disclosed purpose/structure of (forming) a chip level package. For example, inter alia, the Alvarez side surfaces 520 must also be etched free of the cured layer of coating 410 as Alvarez states at Col. 2, lines 36 to 41, ... .” Note that an even thickness of the layer of coating 410 would be obtained in a structure with various bumps through applying a gaseous etchant.

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On page 19, Applicant further argues that "Having 'two or more various shaped bump structures' as claimed in the instant invention, and for which the Examiner cites Hikita to combine with Alvarez under 103(a), would render Alvarez effectively inoperative and thus Alvarez teaches away from the instantly claimed invention." However, examiner disagrees. With the detailed discussion above, this argument is speculative without basis.

On page 19, Applicant argues that "...the prior art lack a suggestion that Alvarez should be modified in the manner suggested by the Examiner as required to meet the claims; the Examiner has made a strained interpretation of the cited references that could be made only by hindsight; the Examiner has not presented a convincing line of reasoning as to why the claimed subject matter as a whole, including its differences over the prior art would have been obvious; and the prior art references do not contain any suggestions." The examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of primary and secondary references. In re Nomiya, 189 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. In re McLaughlin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. In re Bozek, 163 USPQ 595 (CCPA) 1969. In response to Applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of

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ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. In re McLaughlin, 443 F.2d 1392; 170 USPQ 209 (CCPA 1971).

### *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

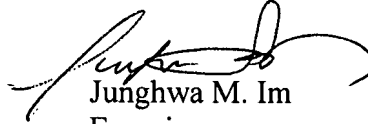
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on (571) 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Junghwa M. Im  
Examiner  
Art Unit 2811

jmi  
7/31/2007